DOCUMENT RESUME

ED 264 145 SE 046 316

AUTHOR Chandler, William U.
TITLE Banishing Tobacco. Worldwatch Paper 68.
INSTITUTION Worldwatch Inst., Washington, D.C.
REPORT NO ISBN-0-916468-68-2
PUB DATE Jan 86
NOTE 53p.
AVAILABLE FROM Worldwatch Inst., 1776 Massachusetts Ave., N.W., Washington, DC 20036 ($4.00).
PUB TYPE Reports - General (140)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Academic Achievement; *Cancer; *Death; Drug Abuse; Drug Use; Foreign Countries; Performance Factors; Physical Health; Policy; *Smoking; *Tobacco; *World Problems

ABSTRACT

This report focuses on topics and issues related to the global use of tobacco. It consists of an introduction and six major sections. These sections deal with: (1) the epidemic rate at which smoking is spreading, indicating that the global rate has grown nearly 75 percent over the past two decades and is growing at 2.1 percent per year, faster than world population growth; (2) health factors, indicating that lung cancer is predominantly a disease of smoking and showing the international correlation between cigarette consumption and lung cancer deaths after 20 years of smoking; (3) sidestream smoke (which wafts from a smoker's cigarette to an involuntary smoker) and its effects on others, indicating that passive smoking has been correlated with lung cancer in nonsmoking spouses of smokers in more than 10 studies; (4) effects on children, indicating that in one United States survey, smokers gave birth to underweight babies twice as often as other women did; (5) antismoking efforts to date; and (6) stronger measures, such as banishing tobacco by prohibiting tobacco from workplaces and public buildings. Data tables are included when applicable, for example, on cigarette use in selected countries (1984), and smoking among United States males by educational level (1982). (JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

Worldwatch Institute is an independent, nonprofit research organization created to analyze and to focus attention on global problems. Directed Lester R. Brown, Worldwatch is funded by private foundationns and United Nations organizations . Worldwatch papers are written for a worlwide audience of decision makers, scholars , and the general public.

Banishing Tobacco

William U. Chandler

Worldwatch Paper 68
January 1986

Sections of this paper may be reproduced in magazines and newspapers with acknowledgment to Worldwatch Institute. The views expressed are those of the author and do not necessarily represent those of Worldwatch Institute and its directors, officers, or staff.

©Copyright Worldwatch Institute, 1986
Library of Congress Catalog Card Number 85-52313
ISBN 0-916468-68-2

Printed on recycled paper

Table of Contents

Introduction 5
The Epidemic Spreads 6
The Direct Cost of Addiction 12
Victims of Others' Smoke 21
Effects on Children 23
Antismoking Efforts to Date 26
Stronger Medicine 32
Notes 39

5

Tobacco causes more death and suffering among adults than any other toxic material in the environment. This has long been known, but now it is feared that involuntary exposure to cigarette smoke causes more cancer deaths than any other pollutant. Protecting nonsmokers from cigarette smoke will require a marked change in society's treatment of tobacco, one that could also help eliminate its direct threat to users themselves.

No country is yet taking action against tobacco commensurate with the cost it imposes. The global use of tobacco has grown nearly 75 percent over the past two decades. In China, use has doubled. In only four countries are fewer cigarettes smoked now than in 1964. In the United States, the percentage of adults who smoke has fallen from 43 to 32 percent, but even there 20 percent more tobacco is used than when an antismoking campaign began in 1964, and the country still ranks third in the world in per capita cigarette use.[1] The direct health costs, the health risks to passive smokers, and the economic costs have grown proportionally.

The worldwide cost in lives now approaches 2.5 million per year, almost 5 percent of all deaths. Tobacco kills 13 times as many Americans as hard drugs do, and 8 times as many as automobile accidents. Passive smokers (those who must inhale the smoke of others' cigarettes) are perhaps three times likelier to die of lung cancer than they would be otherwise. The smoking of mothers diminishes the physical and mental capabilities of their children, and in many countries more than one fifth of children are exposed to smoke in this way.[2] These statistics add up to a cost that is increasingly viewed—in countries where the information is available, at least—not only as unnecessary, but as intolerable.

I am grateful to Angela Coyle, who participated in the research for this paper; Jodi Johnson, who assisted in its preparation; Robert A. Bohm, who assisted with the statistical analysis; and Karl Kronebusch, R. T. Ravenholt, and James L. Repace, who reviewed earlier drafts of the manuscript.

Though the health consequences of tobacco are now well known, policies to avoid them lag far behind. Most efforts to control tobacco are merely attempts to control or color information about the product. Governments sometimes warn people that tobacco is unhealthy, forbid its advertisement, or restrict its use in theaters or buses, though often the effort is no stronger than the Japanese cigarette package warning: "~~For your health~~, let's be careful not to smoke too much."[3] No national tobacco control effort has been launched with the vigor of antidrug campaigns, or even of campaigns against toxic chemicals, though hard drugs and chemicals claim far fewer victims than tobacco.

Health leaders in government, international organizations, and public interest groups have also failed in this fight—partly because tobacco is tenaciously addictive, partly because both governments and industry promote tobacco, but partly because the leadership of health and environmental authorities has been weak. This conclusion is borne out not only by the continued high levels of tobacco use in industrial countries, but by the explosive growth of cigarette smoking in Eastern bloc countries and in China. Yet the informational campaigns of concerned health leaders have at least succeeded in getting many analysts to recognize that tobacco is a high-priority, worldwide public health problem. And one that needs stronger medicine.[4]

The Epidemic Spreads

Smoking is an epidemic growing at 2.1 percent per year, faster than world population. (See Figure 1.) Growth in tobacco use slowed briefly in the early eighties, primarily for economic reasons, but is resuming its rapid increase. Over a billion people now smoke, consuming almost 5 trillion cigarettes per year, an average of more than half a pack a day. Even in the United States, where smoking prevalence—the portion of a population who smoke—has declined, the 20 percent increase in tobacco use since 1964 indicates that those who smoke now smoke more heavily.[5]

Greece leads the world in per capita cigarette consumption. (See Table 1.) Japanese, Americans, Canadians, Yugoslavs, and Poles fol-

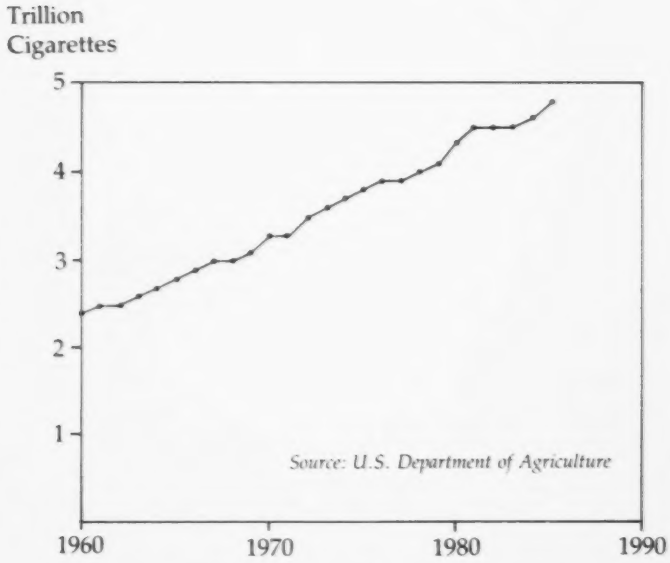


Figure 1: 1960-85 Cigarette Consumption Worldwide

low close behind. People in industrial countries smoke twice as much as people in the Third World. Although Chinese men smoke almost as much as Western men do, the negligible amount of smoking by Chinese women means that country does not rank very high in overall per capita consumption. Nevertheless, China uses a quarter of the world's tobacco.[6]

Tobacco is increasingly grown near where it is consumed. China is the world's leading producer, using all it grows. The United States, India, the Soviet Union, and Brazil rank second through fifth, with all but the Soviet Union being major exporters. Other major Third World exporters include Zimbabwe and Malawi.[7]

Table 1: Cigarette Use in Selected Countries, 1984

8

Country	Cigarette Use Per Capita	Change in Total Consumption Since 1975[1]
	(percent of world average)	(percent)
Greece	237	+ 25
Japan	232	+ 6
United States	227	0
Poland	216	+ 3
Australia	203	+ 9
South Korea	186	+ 45
East Germany	167	+ 23
Italy	162	+ 17
United Kingdom	152	− 27
Soviet Union	150	+ 8
France	145	+ 6
Philippines	130	+ 24
Finland	128	+ 8
Sweden	124	− 3
Egypt	119	+138
Brazil	104	+ 17
China	102	+ 85
Mexico	77	+ 10
India	56	+ 33
Kenya	37	+ 48
Zimbabwe	35	− 35
Bangladesh	19	+ 29

[1]End points are three-year averages.

Source: Worldwatch Institute, derived from U.S. Department of Agriculture data, from United Nations, *World Population and Its Age-Sex Composition by Country* (New York: 1980), and from Population Reference Bureau, *1984 World Population Data Sheet* (Washington, D.C.: 1984).

Change in tobacco use can be measured in two ways: changes in the use of tobacco products, in absolute or per capita terms, and changes in smoking prevalence. Measuring the latter is often preferred by health educators as a sign of progress toward their primary goal, which is to get smokers to quit and nonsmokers not to start. Prevalence also provides an index of a key goal of tobacco control policy—to make smoking socially unacceptable.

9

But the absolute quantity of tobacco used provides an essential measure of total health costs that a society must bear. Indeed, the total number of cigarettes smoked over a lifetime is a more important health index than cigarettes used per day at any given time. Health risks increase in proportion to total amount of tobacco used.[8] Moreover, the quantity of cigarettes smoked, when considered along with smoker-nonsmoker interaction and room ventilation rates, provides a measure of passive smoking.

In 63 countries, total cigarette use increased between 1975 and 1985. Half the global increase in tobacco use in the last decade has occurred in China, though the Chinese represent only one fifth the world's people. The rest of the Third World, 54 percent of all humans, accounted for a little less than a third of the increase. Consumption in the West and in Eastern bloc nations increased in rough proportion to their shares of the world population.[9]

In the second measure of change in use—smoking prevalence—Western nations have seen encouraging reductions during the last decade. In the United Kingdom, the percentage of males who smoke dropped by more than 25 percent. In the Netherlands and the United States, the equivalent reductions were more than a third. And in Norway, a nation often cited as having a model tobacco policy because it completely bans advertising, a one-fifth reduction in smoking among men with some higher education has been reported, though 42 percent of men still smoke.[10] (See Table 2.)

In fact, rates of smoking remain quite high among men all around the world. In Bangladesh, two thirds of men smoke, spending on average 5 percent of their household income on tobacco. In Czechoslovakia, the prevalence figure is 57 percent; in south-central European Russia,

Table 2: Prevalence of Smoking Among Men and Women in Selected Countries, Circa 1980

10

Country	Men	Women	All Adults
		(percent)	
Poland	70	30	50
Brazil	63	33	48
Ireland	54	36	45
Canada	44	36	40
Japan	66	14	40
Bangladesh	67	1	37
Netherlands	41	33	37
France	49	25	37
Australia	40	31	36
Norway	42	30	36
United Kingdom	38	33	36
Italy	54	17	35
East Germany	53	17	33
Soviet Union	65	11	33
United States	35	30	32
China	56	1	29
Sweden	31	26	28
India	46	1	24
Greece	41	2	21
Egypt	40	1	21

Source: Worldwatch Institute, based on studies of prevalence in each country as reported in various medical journals and governmental publications.

two thirds of adult males smoke. Smoking among women, on the other hand, remains very low in many countries, including China, Bangladesh, and most of the Third World. Teenage girls in the United States, however, now smoke more than boys do.[11]

ED264145

SE046316

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

✓ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

D. MacGregor

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

"There is an inverse relationship between educational level and smoking in the United States, the Soviet Union, and elsewhere."

One ironic result of campaigns to reduce smoking in the absence of a more general effort to control tobacco has been the marked increase in the use of "smokeless" tobacco. The use of "chew" or "snuff" in the United States has increased by over 40 percent in the last two decades. Much of the new interest in these forms of tobacco comes from teenage boys who like the stimulus of the nicotine, perhaps feel "grown-up" when they try it, and believe that it is safer than smoking. Surveys in some localities show that 20-40 percent of high school boys chew tobacco or use snuff. Unfortunately, these forms of tobacco are strongly linked to oral cancer, an effect seen in India, where chewing—and oral cancer—is common.[12]

11

Smoking prevalence among young people is changing, sometimes for the better, other times not. Although American, British, Norwegian, and Swedish children appear to be starting this habit later in life as well as being less likely to smoke, this is not the case elsewhere. More young people than adults smoke in Eastern bloc countries, Canada, and Egypt. In some schools surveyed in Santiago, Chile, two thirds of the students smoked. Even in developing societies—among Polynesians, for example—smoking rates reach levels exceeding 50 percent in children. Ironically, in the United Kingdom, a quarter of the children surveyed in one study reported being given their first cigarette by their parents, or at least smoking it in their presence, before age 12.[13]

Measuring smoking by educational level also reveals trends with important implications for policymaking. There is an inverse relationship between educational level and smoking in the United States (see Figure 2), the Soviet Union, and elsewhere. Over 60 percent of U.S. adult males with only a primary education smoke, while less than 20 percent of men with an advanced degree are smokers. This relationship appears to hold in most of Western and Eastern Europe. It is true for women as well, at least in the United States, with the exception that women who have only a grade-school education seldom smoke.[14] In these countries, at least, smoking thus no longer symbolizes fashion, status, and upward mobility, but the opposite.

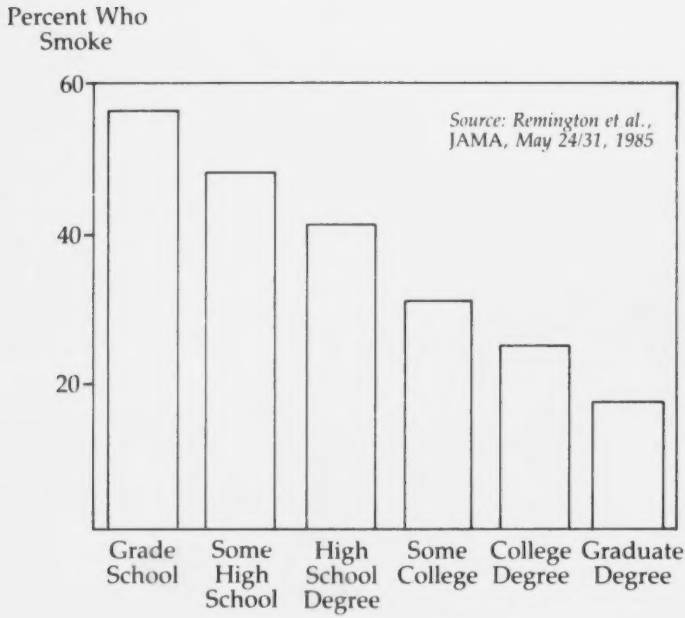


Figure 2: Smoking Among U.S. Males, by Education Level, 1982

The Direct Cost of Addiction

No avoidable condition claims more adult lives than tobacco addiction. Between 2 million and 2.5 million smokers die worldwide each year from heart disease, lung cancer, and emphysema—smokers' disease, as it is called—caused by their addiction. Additional thousands die in fires caused by cigarettes and from cancers caused by tobacco consumed as snuff or chew. Almost one fifth of all U.S. deaths can be traced to cigarette smoke.[15] (See Table 3.)

Spanish settlers discovered 450 years ago that tobacco was "impossible to give up," even when they were reproached for "a disgusting habit." Despite common knowledge that smokers have "nicotine fits," scientific understanding of the addictive power of tobacco has progressed slowly. Much more remains to be known, but it seems certain that nicotine is the addictive agent in tobacco, although oral stimulation and the physical manipulation of smoking materials are also habituating to some degree.[16]

The addictiveness of tobacco, in any case, is beyond question. British scientists A.C. McKennell and R.K. Thomas found in 1967 that only 15 percent of teenagers who experimented with tobacco were later able to quit. Others, notably W.A. Hunt and J.D. Matarazzo, have found that 75 percent who do quit smoking start again within six months. Quitters very often "crave" tobacco, probably nicotine, even several years after quitting. There is a withdrawal period of about two weeks, however, during which unpleasant physical symptoms arise as a result, it seems, of the brain's chemical dependence on nicotine.[17]

Table 3: United States: Mortality Due to Tobacco and Selected Other Causes, 1984

Cause of Death	Annual Deaths	Share of Total Deaths
	(number)	(percent)
Tobacco Use	375,000	18.8
Alcohol Use	100,000	4.7
Automobile Accidents	50,000	2.3
Use of Hard Drugs	30,000	1.4
Suicide	27,500	1.3
Homicide	19,000	.9

Source: Worldwatch Institute, based on National Center for Health Statistics, *Health, United States, 1984* (Washington, D.C.: U.S. Government Printing Office, 1984), and on R. T. Ravenholt, "Addiction Mortality in the United States, 1980: Tobacco, Alcohol, and Other Substances," *Population and Development Review*, December 1984.

Withdrawal from tobacco differs from that of heroin only quantitatively, and it is satisfaction of the addiction itself that leads some smokers to believe that tobacco makes them more alert and clearer thinkers. It is more immediately rewarding than caffeine, for example, which takes almost 30 minutes to reach the brain when ingested as coffee. A "hit" of tobacco reaches the brain in 30 seconds.[18]

14

Cigarette smoke contains, in addition to addictive nicotine, hundreds of mutagens, carcinogens, and cocarcinogens, some 4,000 other chemical compounds, and simple carbon monoxide. These chemicals, including radioactive polonium, not only attack the lungs but reach the bloodstream—where they circulate, causing or accelerating atherosclerosis (clogging of the arteries) and cancer in internal organs.

Heavy smoking can precipitate heart attacks when inhaled carbon monoxide displaces oxygen in the blood. Concentrations of up to 10 percent carbon monoxide in blood hemoglobin can, when coupled with reduced blood flow in heart arteries as a result of atherosclerosis, starve heart muscle of oxygen and damage or destroy the heart muscle—that is, cause a heart attack. The risk is serious at any age, but it is so clearly responsible for most heart attacks in young men that some scientists have called it a disease of smokers. The risk of heart attack among young men who smoke more than two packs per day is over seven times higher than for nonsmokers. (See Figure 3.) Fortunately, the risk diminishes rapidly in ex-smokers, approaching that of nonsmokers within one year after they quit.[19]

Fifteen to 30 percent of all heart attacks in the United States and perhaps a third in the United Kingdom are caused by smoking. Smoking is also the leading cause of death from cardiovascular disease for those middle-aged or younger in West Germany, Scandinavian countries, and Australia. An estimate of such deaths worldwide due to smoking cannot be reliably made, however, because of the complicating factors of diet and life-style.[20] This constraint may lead to an underestimate of overall mortality due to tobacco use.

A related cardiovascular disease caused by smoking is arteriosclerosis of the peripheral arteries. As in heart attack and stroke, smoking

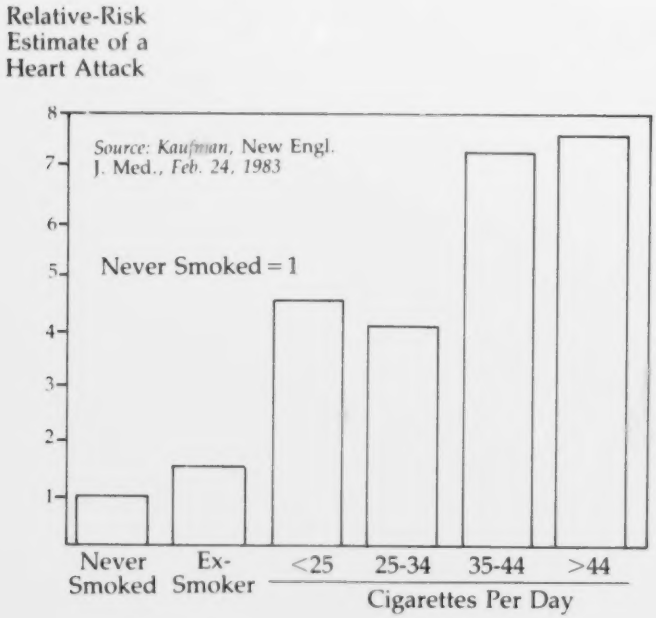


Figure 3: Additional Risk of Heart Attack Due to Smoking, U.S. Males Aged 30-44

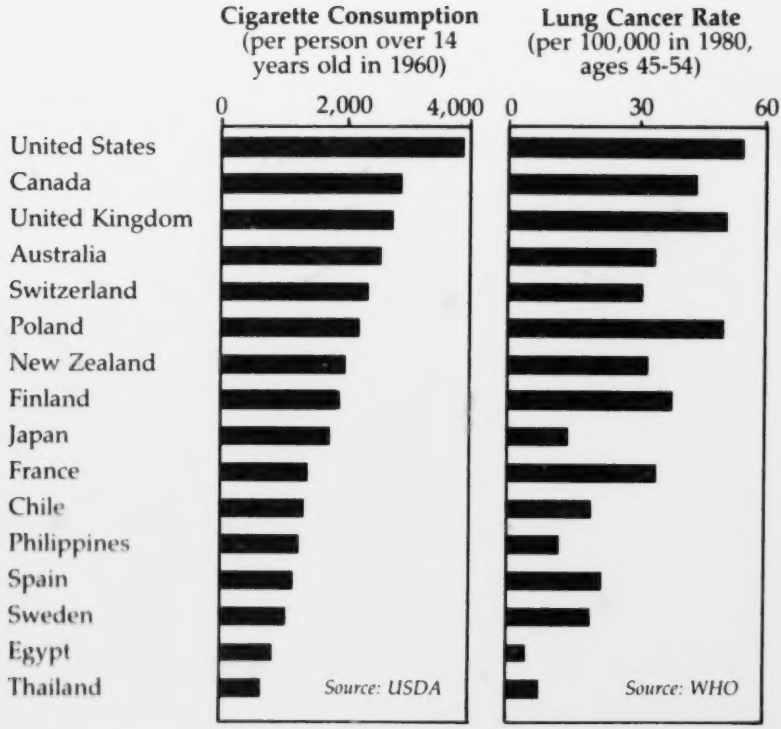
accelerates or precipitates blockage of arteries. Blockages in the limbs reduce blood supply to muscles and can cause gangrene, sometimes necessitating amputation of victims' legs. Peripheral vascular disease is also an important cause of death due to blood clots moving to the heart.[21]

Smoking carries special risks for young women. One study of women under age 50 found the risk of heart attack to be 10 times greater in

women who smoked two packs per day. The authors attributed two thirds of the heart attacks in the group to smoking. A Canadian study found that females who smoked heavily were 7 to 34 times more likely to have a heart attack. Significantly, it also found that women who both smoked heavily and took birth control pills were 8 to 39 times more likely than nonsmokers to have heart attacks. The authors concluded that women under 35 could safely take the pill without additional risk of heart attack, but only if they did not smoke. A review of the epidemiology of heart attacks in women found that female heart attack victims die on average 19 years earlier than other women.[22] Unfortunately, in industrial nations young women are the group whose rate of smoking is increasing fastest.

Some observers have suggested that because carbon monoxide seems to play a role both in the development of atherosclerosis and in the precipitation of heart attacks, safer cigarettes can be developed by reducing their carbon monoxide production. Studies have demonstrated, however, that most cigarettes deliver similar levels of carbon monoxide, even when advertised (as required in a few European countries) as lower in carbon monoxide. Worse still, low tar and nicotine cigarettes may cause many people to smoke more cigarettes to satisfy their addiction, leading to even greater carbon monoxide inhalation.[23]

Lung cancer is predominantly a disease of smoking. Active smoking habits account for an estimated 85 percent of lung cancer. The claims of the tobacco industry that some types of people are predisposed to lung cancer and that some unknown mechanism unrelated to smoking habits causes this condition are unlikely to prove true, because different rates of smoking in men and women over different periods of time produce different rates of lung cancer. When women in the United States did not smoke, for example, they rarely developed lung cancer. But as they took up the habit, lung cancer increased in proportion, after the lag of 20 years that it takes for cancer to develop following exposure to mutagens. In fact, in 1981 lung cancer was as prevalent as breast cancer in American women over age 55 for the first time.[24]



17

Figure 4: International Correlation Between Cigarette Consumption and Lung Cancer Deaths After 20 Years of Smoking

International comparisons of lung cancer rates and earlier smoking habits show a strong correlation.[25] (See Figure 4.) Nonindustrial societies with high smoking rates have high lung cancer rates; Poly-

nesians and New Zealanders have little industry, smoke heavily, and have high rates of lung cancer. Trends such as these across varied sections of the world population also tend to implicate smoking over industrial air pollutants as the cause of lung cancer. Smoking may even explain much of the lung cancer in nonsmokers. It should be noted, however, that lung cancer is a function of lifetime smoking habits, not just the use of cigarettes at one given point in time.[26]

Cancer of the bladder, pancreas, lip, mouth, esophagus, and pharynx can also be traced to the use of tobacco, though alcohol plays a strong role in the last two types. The use of tobacco may be linked with cervical cancer and stomach cancer as well, although these connections are less clear.[27]

Smoking causes two other serious lung diseases—bronchitis and emphysema, referred to together as Chronic Obstructive Lung Disease. Bronchitis is a condition of secretions in the large air passages of the lung system that reduces the lungs' ability to expel germs and can lead to infection. In emphysema, the air sacs in the lungs coalesce and become less efficient in absorbing oxygen and releasing carbon dioxide. Smoking kills 52,000 Americans each year through Chronic Obstructive Lung Disease.[28]

The link between tobacco and other causes of death must not be overlooked. Fires caused by cigarettes kill between 2,000 and 4,000 Americans each year. And passive smoking may cause 5,000 lung cancer deaths each year in the United States alone.[29] Altogether, smoking causes 10-20 percent of deaths in Europe and the United States. (See Table 4.)

Several nations have attempted to estimate the direct economic cost of smoking. A major item, naturally, is health care. In the United States, smoking's toll amounts to $12-35 billion per year—3-9 percent of all health care costs. Smoking claims a similar proportion of the total health care expenditures in Australia, Canada, Switzerland, and the United Kingdom.[30]

But the cost of smoking extends beyond health care expenditures. Lost income due to death and lost work due to illness cost the United

Table 4: Tobacco's Toll in Lives, Selected Countries, Circa 1982

Country	Annual Deaths	Share of Total Deaths
	(number)	(percent)
West Germany	140,000	21
United States	375,000	19
United Kingdom	100,000	18
Canada	30,000	17
Italy	97,600	17
New Zealand	4,000	15
France	77,000	14
Australia	11,000	10
Denmark	5,000	9
Sweden	3,200	4

Source: Derived by Worldwatch Institute from various medical journal and governmental reports.

States $27-61 billion a year. Thus, health expenditures plus economic losses in that country range from $38-95 billion, or $1.25-3.15 per pack.[31] These totals do not include the cost of tobacco itself—about $30 billion per year. Nor do they include the suffering borne by victims and their families.

The economic costs of smoking have generated considerable attention and controversy. Policymakers concerned with budget deficits sometimes view the billions of dollars spent on publicly funded health care for dying smokers as an unnecessary expense. Some economists argue that these are merely financial costs that would be incurred anyway if smokers lived longer, became infirm, and needed medical care. This may be true financially, but from a benefit/cost point of view, smoking imposes unnecessary costs.

If smokers did not smoke, they would live longer and probably enjoy a better quality of life. These are the benefits of policies that reduce

and prevent smoking. The improvements in health are benefits in their own right, even if they do not lead to reduced health care costs. Some economists also argue that the jobs and incomes created by the tobacco business must be counted as benefits. Yet, even if other uses of land were not available, tobacco's economic costs alone would exceed its "benefits" by more than two to one.[32]

These costs, moreover, do not include the environmental and agricultural costs of tobacco production. Tobacco curing consumes 1-2 percent of all wood burned each year in Kenya and Tanzania, and one third of all wood harvested in Malawi, where harvesting far exceeds sustainable yields. Many agricultural countries, including Brazil, China, India, Pakistan, and Zimbabwe, dedicate the equivalent of between 0.5 percent and 7 percent of cropland to tobacco, with the United States and China using slightly less than 1 percent in this way. Though these percentages are small relative to global resources of land and firewood, in some countries they become significant. If planted in grain, the land would be sufficient to feed 10-20 million people—assuming, of course, that production and marketing conditions could be created to encourage food production on tobacco land.[33]

Tragically, the cost in lives and money can only be expected to grow. Seventy-three percent more tobacco is consumed now than 20 years ago, so without a sudden drop in smoking, lung cancer deaths, for example, will almost certainly increase by 50 percent by the turn of the century. Many such losses will occur in nations totally unprepared to deal with the new epidemic. But even in the West, where billions of dollars are spent in a fight to control lung cancer, fewer than 10 percent of such patients are cured of their disease. The prospects of surviving for even one year are dismal. Fortunately, the relative risk of lung cancer for ex-smokers, compared with people who never smoked, diminishes to below detectable levels 10-30 years after a smoker quits. Thus, if tobacco use could be halted, this projection would not materialize.[34]

It follows, too, that the incidence of bronchitis and emphysema will grow as tobacco use grows. At the current rate, the next 20 years would also witness an increase of 50 percent in these diseases. Heart

"Without a sudden drop in smoking, lung cancer deaths will almost certainly increase by 50 percent by the turn of the century."

disease is far more complicated to predict, for it is tied to hypertension, diet, and other factors.

Assuming current trends, the already devastating cost of tobacco is certain to increase over the next few decades. Ironically, it may take the growing realization of this habit's high costs for passive smokers to actually bring about effective action. For no matter how convincing the direct costs may be to rational thinkers, smokers—being addicted—may not be able to act rationally to solve the problem of smoking.

21

Victims of Others' Smoke

Sidestream smoke—which wafts from a smoker's cigarette to an involuntary smoker—puts into the surrounding air 50 times the amount of carcinogens inhaled by the user. It contains several thousand other compounds, many of which cause irritation and allergic reactions in the eyes and nose. Cigarette contamination of indoor air has been linked to increased risk of lung cancer in nonsmoking spouses and to respiratory disease in infants. The scale of these effects has only recently attracted attention, and much more work is urgently needed to define their total impact.[35]

Passive smoking has been correlated with lung cancer in nonsmoking spouses of smokers in more than 10 studies. One particularly important study was derived from other research designed to track lung cancer in smokers in Japan. This work lent itself to a consideration of passive smoking because careful records were kept of spousal smoking habits. Wives who did not smoke but who lived with heavy smokers were found to be almost twice as likely to die of lung cancer as wives of men who did not smoke.[36] (See Figure 5.)

A parallel study in Greece yielded similar results. Lung cancer occurred over twice as often as expected among nonsmoking wives of Greek smokers. Several U.S. studies have now also shown such increased risk of lung cancer for nonsmokers whose spouses smoke. And in West Germany, a report on passive smoking risks showed that nonsmoking women with lung cancer were three times more

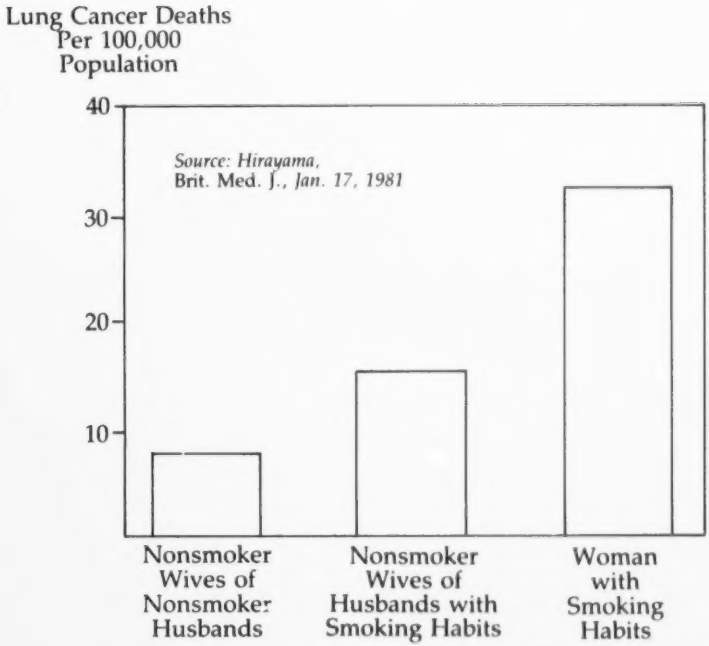


Figure 5: Lung Cancer Mortality in Japanese Women Whose Husbands Smoked

likely than average to have husbands who smoke. Moreover, a careful examination of their workplaces showed they had not been exposed to carcinogens on the job.[37]

Ambient tobacco smoke clearly carries a risk of cancer in nonsmokers. One recent effort to quantify this risk estimated that passive smoking in the United States causes more cancer deaths than all regulated industrial air pollutants combined. The cost in lives may be as high as

5,000 nonsmokers per year, or one third the cases of lung cancer not already directly attributable to smoking.[38]

Nonsmokers are quite likely to have no choice about breathing tobacco smoke. In the United States, people typically spend 90 percent of their time indoors. On the job, some 63 percent of U.S. workers are exposed to tobacco smoke, while at home over 60 percent of all households have at least one smoker. Altogether, only 14 percent of Americans escape being exposed to tobacco smoke in the home or at the workplace. The rest involuntarily "smoke" on average the equivalent of almost 1 cigarette per day. Some people—a musician, for example, who plays in smoky bars and lives with a chain-smoker—passively smoke the equivalent of 14 cigarettes a day.[39]

Protecting the public from the carcinogens in passive cigarette smoke requires urgent action. Increasing the ventilation in a building appears to be impractical because it is prohibitively expensive. Reducing the risk of cancer due to cigarette smoke would require replacing the volume of air in the living space about 250 times more often than is currently the norm—and use, therefore, 250 times the heating, cooling, and pumping.[40] The only certain way to make indoor air safe from cigarettes is to eliminate the source.

Effects on Children

Tobacco's effects on children—beginning with exposure before they are born—deserve special attention. Passive smoking places unborn children at serious risk. Nicotine, numerous toxic chemicals, and radioactive polonium may all interfere with fetal development, and the fetus can receive these substances through the mother's blood whether she smokes or chews tobacco. Furthermore, studies in both industrial and developing countries show that smoking by pregnant women reduces infants' weight at birth by roughly one tenth.[41]

In one U.S. survey, smokers gave birth to underweight babies twice as often as other women did. Research has found a strong, inverse relationship between birth weight and levels of cigarette residue (thiocyanate) in infants' umbilical cords. Low birth weight has also

been associated with tobacco chewing in India. (Thirty-nine percent of women in India chew tobacco.) Because birth weight is a key factor in infant mortality, tobacco use seriously endangers infants' lives.[42]

Nicotine also may be the culprit in spontaneous abortions among women who smoke. Epidemiologist R.T. Ravenholt estimates that smoking causes 50,000 miscarriages in the United States each year. This connection has been observed in Italy as well, where women who smoke miscarry in the first month of pregnancy at a rate of 2.4 percent, compared with 0.9 percent for nonsmokers. Smoking can also cause premature delivery. Nineteen percent of the firstborn infants of Italian women who smoke were premature, twice the rate for nonsmokers. The rate of premature delivery in the Italian study declined by almost 25 percent for the secondborn children of nonsmokers, but it increased slightly for smokers.[43]

Unfortunately, women in many countries are smoking in record numbers, even while pregnant. Surveys in the United Kingdom suggest that about 40 percent of pregnant women smoke. A compilation by Ravenholt of surveys showed that in nations as disparate as Sweden and Chile over a quarter of pregnant women smoked. (See Table 5.) Each year, at least 3 million newborn—the estimated number of live births to women who smoke—are thus potentially handicapped by their mothers.[44]

Children with parents who smoke experience much higher rates of respiratory illness, including colds, influenza, bronchitis, asthma, and pneumonia. One British study published almost 10 years ago showed that children under age one whose mothers smoke more than one pack a day are twice as likely to get bronchitis and pneumonia. This finding has since been repeatedly corroborated.[45]

In addition, the evidence indicates that parental smoking retards child development. One study found that lung capacity in boys was reduced by 7 percent by their mothers' smoking. If the teenage boys also smoked, their lung capacity was reduced by 25 percent. The effect of passive smoking in children can last a lifetime because it delays physical and intellectual development, and because the longer people are exposed to carcinogens, the more likely they are to develop lung cancer.[46]

Table 5: Smoking During Pregnancy, Selected Countries, Circa 1980

Country	Share of Pregnant Women Who Smoke	Infants Exposed
	(percent)	(number)
Ireland	36	26,000
Sweden	34	33,800
West Germany	32	211,700
Canada	26	104,400
Chile	25	31,600
Belgium	25	31,600
Venezuela	24	125,200
Brazil	20	715,800
Yugoslavia	20	73,900
United States	19	706,800
Colombia	19	150,600
Austria	18	15,700
Hungary	13	21,500
Mexico	9	227,300
Japan	8	130,800
Philippines	6	91,600
Bangladesh	3	135,400
Egypt	1	17,700
India[1]	1	96,900

[1]The percentage of women in India who chew tobacco may be high, however.

Sources: R. T. Ravenholt, "Addiction Mortality in the United States, 1980: Tobacco, Alcohol, and Other Substances," *Population and Development Review*, December 1984, and World Bank, *World Development Report, 1982* (New York: Oxford University Press, 1982).

Parents who smoke may also reduce the intellectual development of their children. One study in Italy found that children whose mothers

smoked learned to read more slowly than those of nonsmokers. In the United States, the learning ability of 11-year-olds whose mothers smoke has been shown to lag by six months.[47]

Antismoking Efforts to Date

When a recent medical journal editorial writer rhetorically asked "What if smoking killed baby seals?" he was making the point that environmental and health activists do not accord tobacco the priority it deserves. He suggested that "perhaps the entire antismoking campaign be turned over to Greenpeace."[48] Health and environmental organizations have not moved to protect their constituents' well-being with the same vigor that the tobacco industry protects its pecuniary interests.

Nor have governments assumed their traditional role in protecting public health by acting decisively to reduce tobacco's threat. They move swiftly to remove from the market unsafe medicines. They conduct paramilitary operations to destroy fields of marijuana or opium, but not tobacco, a far deadlier crop. They pay for expensive cleanup operations to remove toxic chemicals from the human environment. But not only do they fail to take these actions for tobacco, which is often more deadly to both users and innocent—or passive—victims, they even support efforts to stabilize the tobacco industry. This sad state of affairs is possible both because the tobacco industry itself is so strong and because the opposition to tobacco is so weak. Health advocates in general have not insisted that governments take appropriate action. They have relied instead on informational programs alone to solve the problem.

Equating smokers with baby seals—as victims rather than willing participants—helps clarify some confusion that contributes to inaction on tobacco. Many people assume it is enough to warn tobacco users, through the media and with labels on tobacco products, of the risks they take and then leave to them the responsibility for their own health. They argue that if users choose to take tobacco's risk, in return for the pleasure or stimulation that it provides, that is their pre-

rogative.[49] To some extent this is true. But the independence and voluntary nature of this choice can be called into question on three counts.

First, tobacco is strongly addictive. Studies have shown that only about one quarter of the people who try more than one cigarette ever succeed in quitting. Young people begin to smoke because of social pressure, curiosity, or a desire to feel "grown-up." But pharmacologically, tobacco acts like heroin in hooking its victims. They rapidly become dependent on nicotine, and then smoke to satisfy their addiction.

Second, smoke harms more than just the smoker. As indicated earlier, children of smokers get sick with respiratory illness twice as often as those of nonsmokers. Their growth and intellectual development as well as lung capacity can be stunted. Exposed for decades to others' smoke, their risk of lung cancer is at least tripled. Similarly, spouses and coworkers of smokers are at higher risk of lung cancer because of smokers' addictions.

Third, when governments act inconsistently in their management of tobacco with respect to other dangerous products that they ban, they confuse tobacco users. Asbestos, heroin, and DDT are banned to protect public health; tobacco is not. This implicitly signals that those responsible for health consider tobacco to be different, and as normal to use. Thus, teenagers can be forgiven for not taking seriously a tiny health warning on shiny new packs of cigarettes. The problem is, of course, made worse when governments actively encourage the production of tobacco.

The point at which society decides to take action on dangerous products is sometimes arbitrary, but it can be based consistently on estimates of risk. It is the overall risk carried by addictive products rather than their capacity to cause addiction per se that—along with economic interest, attitudes, and chance—decides society's treatment of them. Coffee, for example, is addictive but the evidence that it causes cancer or heart disease is mixed. Some studies have estimated that coffee can double the risk of pancreatic cancer; others have found no increased risk at all.

Alcohol is addictive and carries heavy costs for society, though these are at most half as costly as tobacco. Having one drink a day can be tolerated without instilling dependency in most people, so society permits its use. Alcohol, at least, does not quickly addict the majority of those who experiment with it, as do heroin and tobacco. Similarly, nonaddictive products that are carcinogens may be sufficiently low in overall risk to be permitted. Some artificial sweeteners, for example, fall above the level of acceptable risk, while others do not. They may both be carcinogenic, however.[50]

Most U.S. federal regulatory agencies draw this arbitrary line at a level of risk of 1 death in 100,000 or, alternatively, 1 in 1 million people over a lifetime of exposure. The risks from passive smoking probably exceed this by a factor of 250. Active smoking, of course, exceeds the lower level by 100,000 because it causes cancer in 1 in 10—some would say 1 in 5—users. Thus, forbidding the sale of tobacco would be consistent with the prohibition of the sale of addictive drugs that harm the user and others. Banning tobacco would also be consistent with the control of strong carcinogens with very high risk factors.

Some people argue that individuals should be able to do whatever they want in the privacy of their own homes. This is an acceptable, even admirable attitude that favors civil liberties. But the limit to one person's pursuit of happiness begins at the point where it clearly harms others. If smokers are to be permitted to harm themselves but forbidden to harm their children, spouses, and coworkers, they will have to smoke in their backyards. Because control of tobacco use in private homes is both politically and practically infeasible, the only realistic way to protect children—if parents fail to do so—is to control the product itself.

Societies urgently need to examine how to better control tobacco use, for the current strategy of informational campaigns is not working well. The basis of antitobacco action since the mid-sixties has been information aimed at educating smokers about their health risks and discouraging nonsmokers from starting. The campaign seeks through media coverage of scientific studies to persuade smokers to quit and children never to start. It tries to change society's attitude from a view

of smoking as glamorous to one that sees the habit as socially unacceptable. This approach has been tested in a few countries such as Finland, Norway, Sweden, and, to lesser extents, the Netherlands, the United States, and the United Kingdom. It has been practiced de facto in many Eastern bloc countries and in China.[51] The results are decidedly mixed. (See Table 6.)

Absolute cigarette consumption has fallen over the last 10 years in only a dozen countries. Of these, only four had moderate to strong antismoking policies, while eight had weak ones. Reduction in countries with weak policies can be attributed to economic decline, specifically to higher costs of imported cigarettes and reduced per capita income.

A dozen countries have had strong antismoking measures—by today's standards—but have experienced strong growth in tobacco use. Tobacco advertising is prohibited in Poland and restrictions are placed on smoking in public, yet that nation ranks among the highest in per capita cigarette consumption in the world. Advertising bans and other antismoking policies exist in China, East Germany, and the Soviet Union, but smoking nevertheless continues at very high levels, at least among men.

Finland, Norway, and Sweden, in contrast, have imposed advertising bans and required strong warnings on tobacco labels, and they have experienced better results. Norway's antismoking policy is exceeded in strength by only four other countries, and tobacco consumption has declined by 15 percent since the imposition of that policy. (This decline takes into account the large use of roll-your-own tobacco in that country.) Sweden's policy has been somewhat weaker than those of other Scandinavian countries, but consumption is down some 3 percent since 1974, about the time its policy was initiated.

Bulgaria, Hungary, and the Soviet Union have the strongest policies in the world. Bulgarians now smoke 2 percent fewer cigarettes than 10 years ago, while the Soviets and the Hungarians use 8 and 4 percent more, respectively.

Table 6: Cigarette Use and Antismoking Policies, Selected Countries, 1974-84

30

Country	Annual Change in Use of Cigarettes	Package Warning Label	Advertising Ban		Bans in Public Places	
			Total	Partial	Strong	Weak
	(percent)					
Argentina	+0.1					
Australia	+0.9	X		X		
Brazil	+1.6	X				
Bulgaria	−0.2	X	X		X[1]	
China	+6.2		X			X
Egypt	+8.7	X		X		X
Finland	+0.8	X	X		X	
France	+0.6	X		X	X	
Hungary	+0.4	X	X		X	
India	+2.9	X				
Italy	+1.6		X		X	
Japan	+0.6	X				X
Kenya	+3.9					X
Mexico	+1.0	X		X		
Netherlands	−3.3	X		X		
Norway	−1.6	X	X			
Poland	+0.3		X		X[1]	
Soviet Union	+0.8	X	X		X	
Spain	+1.6			X		
Sweden	−0.3	X		X		
United Kingdom	−3.1	X		X		
United States	0	X		X		X

[1]Includes restrictions on smoking in the workplace.

Source: Worldwatch Institute, based on Ruth Roemer, *Legislative Action to Combat the World Smoking Epidemic* (Geneva: World Health Organization, 1983), and on U.S. Department of Agriculture, Foreign Agricultural Service, "Tariff and Nontariff Measures on Tobacco," *Foreign Agricultural Circular*, Supplement 1-84, Washington, D.C., January 1984.

Countries with weaker policies but better results include Belgium, the Netherlands, and the United Kingdom. These governments permit advertising in print but forbid it on electronic media. They have

negotiated voluntary warnings on tobacco products with the tobacco industry. Perhaps most importantly, they have conducted vigorous antismoking educational campaigns. Cigarette consumption has declined 20 percent or more over the last 10 years in these nations. The per capita consumption level in each is below the average for industrial countries, though well above the mean for the world. Only in the United Kingdom, however, is consumption lower than 20 years ago.

Some countries have had dramatic declines in cigarette consumption without even trying. Drops in consumption of 7 to 32 percent in Bolivia, Chile, and Zaire can be attributed to their economic difficulties: Their antismoking policies are among the weakest in the world.

Changes in income affect tobacco consumption, though the strength of the income effect depends on a country's stage of development. A statistical analysis of 29 industrial and developing countries suggested that, overall, cigarette consumption increases about 3 percent for every 10 percent rise in income. This relation does not apparently hold for industrial countries, however. Consumption seems more related to price and social attractiveness in countries such as the United States, where price increases of 10 percent appear to reduce consumption by 3 to 4 percent. The largest decline ever in U.S. cigarette use occurred, in fact, in 1983, when the government imposed a tax of about 8 percent of the retail price.[52]

This analysis also reveals that the strength of a nation's tobacco information policy does not appear to reduce consumption, if income and price are taken into account. The result suggests that the stronger the antitobacco policy, the greater the consumption and the higher the rate of increase in consumption. This "nonsense" result, of course, can be explained simply. Countries that have had a problem with cigarette consumption are more likely to have taken steps that they believe will reduce that problem. Unfortunately, the steps taken to date have been too weak to achieve the desired results. Lack of time to take effect could also be a factor, although most policies have been in place for almost a decade.

Stronger Medicine

32 Health advocates have generally dismissed stronger medicine for dealing with smoking and tobacco. The U.K. Royal College of Physicians, for example, the first governmental body in the world to launch a campaign to save the health of smokers, has conceded that banning tobacco is impractical. The physicians compared such a move to prohibition, and expressed fear that it not only would be unenforceable, but would lead to criminality.[53] Yet, there are a few effective ways to strengthen tobacco control policies without an outright ban.

The policy questions are how to prevent the young and the naive from beginning to smoke, how to persuade smokers to quit, and how to protect the health of passive or involuntary smokers in the interim. When naive smokers first light up without understanding the life-threatening implications of their careless experimentation, they can become addicted and, in effect, "involuntary" smokers themselves. Psychology and medicine currently do not know much about how to help these addicts, other than to recommend that they quit cold turkey.[54]

This dilemma may be unique in medicine: A dangerous drug clearly should—but cannot—be banned. The economic strength of the tobacco industry is so great that it can exploit for its own purposes the safeguards built into democracies to protect legitimate minorities. In nondemocracies, governments may lack the credibility—and the motivation—to tackle so insidious and pernicious a habit. And under both systems the social conditioning and chemical habituation characteristic of tobacco make banning the product a formidable task, one that would take a long time. Yet the current "informational" campaign to control tobacco is falling behind as worldwide use increases faster than population.

An alternative approach is inherent in a new movement to protect passive smokers: banishing tobacco. This campaign, which stops short of an outright ban of tobacco sales, includes either the prohibition of smoking in the workplace and in public buildings or the strict limitation of smoking to specified areas. The movement may be the

"By banishing tobacco use from places where innocent people will be exposed and placed at risk, thousands of lives may be saved."

single greatest success of the informational campaign against tobacco. Its leaders insist that despite the continued sale, advertising, and use of tobacco, nonsmokers—the majority in most societies—have every right not to be exposed to the carcinogens, carbon monoxide, and irritants in tobacco smoke.[55] Such a campaign can make three important contributions.

First, by banishing tobacco use from places where innocent people will be exposed and placed at risk, thousands of lives may be saved. Second, forcing smokers to give up their habit while in the presence of nonsmokers will provide them with an added impetus to quit. If smokers must get through working days without smoking, then they are more likely to be able to quit completely. This has been the result of bans in Minnesota and California.[56] In any case, their total dosage of carcinogens and carbon monoxide should decline. And third, by stigmatizing tobacco use as dangerous and antisocial, the passive smokers' rights movement can accomplish a goal of all antismoking informational campaigns: to make smoking socially unattractive.

The passive smokers' rights campaign focuses on the workplace, public gathering places, and public transportation. Many countries now prohibit smoking on public transportation and in theaters and auditoriums, though the impetus for these restrictions has usually been conventional safety concerns. In a few areas, such as the state of Minnesota and the cities of San Francisco and Los Angeles, smoking is now prohibited in public buildings (except in restricted areas) and nonsmokers must be protected in restaurants and on the job.[57]

Interestingly, nonsmokers have an important ally in the workplace: employers. Companies, at least in the United States, are rapidly realizing two things. First, most of their employees do not smoke and do not like to breathe the smoke of others. Second, smokers cost employers money. Surveys indicate that the combination of inefficiency and ill health as a result of smoking wastes about 7 percent of a smoker's working time. They also suggest that smokers cost employers at least $650 each per year.[58] Smokers add to insurance and cleanup costs, and they reduce nonsmoker employee morale.

American industry is responding rapidly to the nonsmoker movement. A number of well-known industries have prohibited smoking on the job for most employees. (See Table 7.) A few even refuse to hire smokers. The predominant trend, however, is toward banishing the practice from the workplace. In 1984, the rate of increase in adoption of policies against smoking for the publishing, insurance, finance, pharmaceuticals, and scientific equipment industries in the United States was between 10 and 25 percent. That is, one tenth to one quarter of the top 1,000 businesses in this group of five industries implemented new policies that year to banish smoking.[59]

A particular difficulty in banishing tobacco is the role of government in promoting tobacco use. This schizophrenic state of affairs persists not just in the market-oriented West, but also in centralized economies. Governments most often own the tobacco industries in these areas. China, the Soviet Union, and India, for example, grow their own tobacco—they are not victims of some cabal of multinational companies. The state-owned tobacco industry in China is being carefully nurtured and expanded rapidly even as another part of the government is telling the Chinese that smoking is bad for them.[60]

These incompatible policies are also in place in the West. In the United States, the U.S. Department of Agriculture administers a price-support system to protect tobacco producers. West European nations subsidize tobacco farmers with about $660 million in price supports each year. Ironically, the systems protect small, inefficient farmers who earn higher prices than they would obtain without the subsidy. More efficient producers, who could underprice the small farmers, are not allowed to compete fully. The result is that tobacco costs the user more than it would without the system. As tobacco use varies negatively in response to price increases, smoking is being directly reduced by price supports.[61]

There is an even more subtle effect, however. The tobacco industry, though it loses the right to compete with small-scale farmers for more of the profit of growing tobacco, gains the powerful political support of the small farmer. The added political clout helps counter anti-smoking forces. Moreover, it retains the appealing appearance of official tolerance and even endorsement of the use of tobacco, which

Table 7: Selected U.S. Corporations with Policies Concerning Smoking in the Workplace, 1985

Policy/Companies	Employees	Date Implemented, If Known
	(number)	
Smoke-Free Areas, Including Work Stations		
CIGNA Insurance (Philadelphia, Pa.)	12,000	
Control Data Corp. (Minneapolis, Minn., and elsewhere)	28,000	January 1984
Grumman Corp.	27,000	November 1984
IBM	200,000	
Pacific Mutual Life Insurance Co. (Newport Beach, Calif.)	1,200	January 1984
Pratt & Whitney Aircraft, Govt. Products Div. (Palm Beach, Calif.)	7,000	
Smoke-Free Except for Cafeteria, Lounges, and Conference Rooms		
Adolph Coors Co. (Golden, Colo.)	10,000	December 1982
Blue Cross-Blue Shield (Minnesota)	1,600	May 1985
The Boeing Co. (Washington state)	83,000	April 1984
Campbells Soup Co. (Camden, N.J.)	3,300	1869
Merle Norman Cosmetic Co. (Los Angeles, Calif.)	1,300	
Raven Industries (Sioux Falls, S. Dak.)	900	May 1983
Unigard Insurance Group (Seattle, Wash.)	1,600	March 1982
Entirely Smoke-Free		
Johns-Manville (Denver, Colo.)	8,000	July 1978
Pacific Northwest Bell (Seattle, Wash.)	15,000	October 1985
Rodale Press (Emmaus, Pa.)	850	January 1982

Source: Personal communications with company representatives, based on list developed by New Jersey Group Against Smoking Pollution, Summit, N.J.

in turn diminishes the effectiveness of the informational campaign in reducing the social acceptability of tobacco. Any child about to start smoking could be inclined to think that the U.S. government sees tobacco use as desirable. This is, of course, the implicit position of any government that promotes tobacco production. Failing to excise this "subsidy," however perverse for the industry, sends a signal both to the young and to other governments that tobacco is not so bad after all.

The overall situation of antismoking efforts, then, is at best a standoff in industrial countries and a rout in developing ones. At the current rate, Western countries will not see a major improvement in the health effects of smoking for many decades, but Eastern and developing countries will see a rapid worsening. It falls to world health leaders to bolster their antismoking efforts. Unfortunately, one lead agency, the World Health Organization, allots less than 1 percent of its budget to this problem, though it calls smoking "the most important preventable health problem in the world." Its current budget for the mid-eighties has no funds for actively reducing tobacco's toll.[62]

Effective policies fall in four categories. The first, continuation of the informational campaign, is worthwhile as a foundation for the others. Now that this exists, at least in some countries, it is time to build on it with more stringent measures.

The second step is for those countries that have low smoking rates, no indigenous tobacco industry, and a reliance on imported tobacco products to ban tobacco altogether.[63] To do so would completely eliminate the epidemic's threat to them, placing these nations in the forefront of the campaign, much as the industrial world spearheaded the campaign to eradicate smallpox.

These governments have an economic incentive to act—the reduction of foreign-exchange losses for the purchase of a nonproductive product. Only a few people in these societies are now severely addicted, making national withdrawal politically easier. Many African nations fall into this category. Unfortunately, other impoverished nations, such as India, do not, because cigarette consumption is already high.

"The overall situation of antismoking efforts is at best a standoff in industrial countries and a rout in developing ones."

The third approach is for those nations that must be politically pragmatic at least to act to protect the health of the innocent. Experience in the United States and in Poland shows that tobacco can be banished from public buildings, from the workplace, and from public eating establishments and meeting places. Banishing cigarette use in the presence of nonsmokers should be considered a minimum level of protection.

All governments can provide national indoor clean air acts for public buildings, workplaces, and entertainment establishments. United Nations organizations would do well to establish no-smoking policies for their employees, especially those who work with children and the poor, for they are unavoidably going to be viewed as symbols of modernity and success, and therefore should not introduce such a clearly harmful product.

The fourth level is to use the power of economic tools to eliminate smoking as much as possible. Estimates of the cost of smoking amount to $1.25-3.15 per pack. A tax of this magnitude in the Western nations would reduce smoking by as much as 40 percent over time. Any tax increase, even of 5-10¢ per pack, would rapidly encourage light smokers to quit in order to avoid the higher cost, would provide additional pressure on the heavily addicted to bring themselves to the point of enduring withdrawal, and, most importantly, would discourage the young (with low incomes) and poor from ever starting. Additionally, tobacco support systems can be dismantled in order to signal that governments now wish to discourage the use of tobacco. This move would be productive even where such a step would lower the price of cigarettes.

These measures will not be easy, nor will they solve the tobacco problem. They will not, for example, assure that children will be protected in the home against the smoke of their parents. They will not protect the newborn from harm as a result of their mothers' smoking. Parents alone can take this responsibility, though in some cases their addiction makes them risk the health and the intellectual development of their children.

New measures will not assure that smokers themselves will be persuaded to quit. Nor will they guarantee that innocent young people do not become addicted before they realize their new habit eventually
38 kills one out of four users.[64] But without more responsible efforts on the part of the health professions and public interest organizations, even these efforts will be held in abeyance

Notes

1. Estimates based on U.S. Department of Agriculture (USDA) computer printout, personal communication, August 29, 1985; U.S. prevalence rates from Department of Health and Human Services (DHHS), National Center for Health Statistics, *Health, United States, 1984* (Washington, D.C.: U.S. Government Printing Office, 1984).

2. Worldwide cost in lives derived from published estimates of heart disease, lung cancer, and emphysema due to cancer; comparisons of the health costs of tobacco based on data from R.T. Ravenholt, "Addiction Mortality in the United States, 1980: Tobacco, Alcohol, and Other Substances," *Population and Development Review*, December 1984; from Royal College of Physicians, *Health or Smoking* (London: Pitman Publishing Ltd, 1983); from Takeshi Hirayama, "Non-Smoking Wives of Heavy Smokers Have A Higher Risk of Lung Cancer: A Study from Japan," *British Medical Journal*, January 17, 1981; from James L. Repace and Alfred H. Lowrey, "A Quantitative Estimate of Nonsmokers' Lung Cancer Risk from Passive Smoking," *Environment International*, Vol. 11, 1985; and from Ira B. Trager et al., "Longitudinal Study of the Effects of Maternal Smoking on Pulmonary Function in Children," *New England Journal of Medicine*, September 22, 1983.

3. Quote in USDA, Foreign Agricultural Service (FAS), "Tariff and Nontariff Measures on Tobacco," *Foreign Agricultural Circular*, Supplement 1-84, Washington, D.C., January 1984. See also Ruth Roemer, *Legislative Action to Combat the World Smoking Epidemic* (Geneva: World Health Organization, 1983).

4. See, for example, special editions of *New York State Journal of Medicine*, July 1985, and *Journal of the American Medical Association*, May 24/31, 1985, both dedicated to the smoking problem.

5. Estimates based on USDA computer printout. For prevalence in the United States, see DHHS, National Center for Health Statistics, *Health, United States, 1984*. Note also that the percent of U.S. male smokers who consumed more than 25 cigarettes per day in 1965 and 1983 was 24.1 and 33.6, respectively. The respective rates for U.S. female smokers in those years were 13.0 and 20.6 percent.

6. USDA computer printout. The Third World, excluding China, has 54 percent of the world's population and uses 25 percent of the world's tobacco; industrial Western nations, 16 percent of the population and 37 percent of the tobacco; Eastern bloc nations, including the Soviet Union, 8.5 percent of the

population and 16 percent of the tobacco. USDA, computer printout; Population Reference Bureau, *1984 World Population Data Sheet* (Washington, D.C.: 1984).

40

7. USDA, FAS, "Tobacco—World Tobacco Situation," *Foreign Agriculture Circular*, FT 6-85, Washington, D.C., June 1985.

8. Richard Doll and Richard Peto, "Quantitative Estimates of Avoidable Risks of Cancer in the United States Today," *Journal of the National Cancer Institute*, November 1981; U.S. Department of Health, Education, and Welfare (DHEW), Public Health Service, *Smoking and Health: A Report of the Surgeon General* (Washington, D.C.: Government Printing Office: 1979).

9. Estimates based on USDA computer printout.

10. Royal College of Physicians, *Health or Smoking*; DHHS, National Center for Health Statistics, *Health, United States, 1984*; Hans Adriaanse et al., "Physicians, Smoking, and Health in the Netherlands," *New York State Journal of Medicine*, July 1985; K. Bjartveit et al., "Controlling the Epidemic: Legislation and Restrictive Measures," *Canadian Journal of Public Health*, November/December 1981.

11. J. Akbar, N. Cohen, and A.R. Measham, "Smoking and Respiratory Disease Symptoms in Rural Bangladesh," *Public Health*, November 1983; A. Kubik, "The Influence of Smoking and Other Etiopathogenetic Factors on the Incidence of Bronchogenic Carcinoma and Chronic Nonspecific Respiratory Diseases," *Czechoslovak Medicine*, Vol. 7, No. 1, 1984; Soviet data cited in U.S. Office of Smoking and Health translated abstract of A.G. Shevchuk and R.N. Tarasova, "The Organization of Antismoking Education," *Zdravookhraneniye Rossiyskoy Federatsii*, Vol. 5, 1983; Dean T. Jamison et al., *China: The Health Sector* (Washington, D.C.: World Bank, 1984); DHHS, National Center for Health Statistics, *Health, United States, 1984*.

12. Figures for U.S. increase from Verner Grise, USDA, private communication, September 9, 1985; Claudia Wallis, "Into the Mouths of Babes," *Time*, July 15, 1985; L.D. Sanghvi, K. Jayant, and S.S. Pakhale, "Tobacco Use and Cancer in India," *World Smoking and Health*, Winter 1980.

13. DHHS, National Center for Health Statistics, *Health, United States, 1984*; information on British children from "Curry-Eating Teenage Smokers Cough On," *New Scientist*, April 21, 1983; information on Norwegian children from Bjartveit et al., "Controlling the Epidemic: Legislation and Restrictive Measures"; P. Nordgren, "Sweden Launches New Anti-Smoking Offensive:

Government-Appointed Commission Presents New Plans for a 25-Year Program," Comprehensive Smoking Prevention Education Act, Hearings before the Subcommittee on Health and the Environment, U.S. House of Representatives Committee on Energy and Commerce, March 5, 11, and 12, 1982; information on Eastern bloc from translated asbtract, D.N. Loranskiy et al., "The Smoking Problem," *Sovetskoye Zdravookhraneniye*, 1983 (in Russian); "18-19-Year-Old Women Are Smoking Up a Storm," *Canadian Family Physician*, August 1983; L.A. Cappiello and E.A. El Maksoud, "A Profile Study of High School Boys Who Smoke Cigarettes in Alexandria, Egypt, and Buffalo, New York," *International Journal of Health Education*, March 1983; I. Salas et al., "Prevalence of Tobacco Smoking in Adolescents in Third Year of Secondary Education," *Revista Medica de Chile*, December 1982 (in Spanish); J. Cohen and M. Solal, "Antismoking Actions in France: Five Year Results," *World Smoking and Health*, Summer 1982; Royal College of Physicians, *Health or Smoking*.

14. Patrick L. Remington et al., "Current Smoking Trends in the United States," *Journal of the American Medical Association*, May 24/31, 1985. The low rate for women with only a grade-school education probably relates to their age. Few women born in the first quarter of this century smoked. These women also were less likely to have had advanced educational opportunities.

15. The estimate of 2 million to 2.5 million annual deaths worldwide includes an extrapolation of lung cancer deaths using an equation derived from death and smoking rates in 20 developed and developing countries. It also includes the sum of the deaths due to heart disease and emphysema in industrial countries, derived from various published estimates (see notes 20 and 25). For the United States, Ravenholt estimates mortality due to tobacco use at almost 500,000, or 25 percent of all deaths. Ravenholt, "Addiction Mortality in the United States, 1980."

16. Jerome H. Jaffe and Maureen Kanzler, "Smoking as an Addictive Disorder," in Norman A. Krasnegor, ed., *Cigarette Smoking as a Dependence Process* (Rockville, Md.: National Institute on Drug Abuse, 1979).

17. A.C. McKennell and R.K. Thomas, *Adults' and Adolescents' Smoking Habits and Attitudes* (London: Her Majesty's Stationery Office, 1967), as cited in M.A.H. Russell, "Tobacco Dependence: Is Nicotine Rewarding or Aversive?" in Krasnegor, *Cigarette Smoking as a Dependence Process*; W.A. Hunt and J.D. Matarazzo, "Three Years Later: Recent Developments in the Experimental Modification of Smoking Behavior," *Journal of Abnormal Psychology*, Vol. 81, No. 2, 1973, as cited in Saul M. Shiffman, "The Tobacco Withdrawal Syndrome," ibid.

18. See various chapters in Krasnegor, *Cigarette Smoking as a Dependence Process.*

19. David W. Kaufman et al., "Nicotine and Carbon Monoxide Content of Cigarette Smoke and the Risk of Myocardial Infarction in Young Men," *New England Journal of Medicine*, February 24, 1983; diminished risk discussed in W.P. Castelli, "Cardiovascular Disease and Multifactorial Risk: Challenge of the 1980s," *American Heart Journal*, November 1983.

20. Some prospective studies, including one forthcoming from the American Cancer Society, suggest a higher range of heart attacks are due to smoking, R.T. Ravenholt, private communication, October 28, 1985. See also Castelli, "Cardiovascular Disease and Multifactorial Risk"; DHHS, Public Health Service, Office on Smoking and Health (OSH), *The Health Consequences of Smoking—Cardiovascular Disease: A Report of the Surgeon General* (Washington, D.C.: U.S. Government Printing Office, 1983); and A. Keys et al., "The Seven Countries Study: 2,289 Deaths in 15 Years," *Preventive Medicine*, March 1984.

21. See Jay D. Coffman, "Diseases of the Peripheral Vessels," in James B. Wyngaarden and Lloyd H. Smith, eds., *Cecil Textbook of Medicine* (Philadelphia: W.B. Saunders Company, 1982); S. Shinonoya, "What is Buerger's Disease?" *World Journal of Surgery*, July 1983.

22. L. Rosenberg et al., "Myocardial Infarction in Women Under 50 Years of Age," *Journal of the American Medical Association*, November 25, 1983; "Oral Contraceptives, Age, Smoking and Circulatory System Disease," *Chronic Diseases in Canada*, June 1983; epidemiology survey cited is S. Johansson, A. Vedin, and C. Wilhelmsson, "Myocardial Infarction in Women," *Epidemiologic Reviews*, Vol. 5, 1983.

23. C. Borland et al., "Carbon Monoxide Yield of Cigarettes and Its Relation to Cardiorespiratory Disease," *British Medical Journal*, November 26, 1983.

24. DHHS, National Center for Health Statistics, *Health, United States, 1984.*

25. A linear regression (correlation coefficient = .796) of lung cancer deaths in 20 countries on cigarette consumption was performed using data on smoking (adjusted for age) obtained from USDA computer printouts for 1960 and data on lung cancer deaths in 1980, from World Health Organization, *World Health Statistics, 1980-1981* (Geneva: 1981). This method of comparing lung cancer with smoking rates 20 years earlier is similar to one proposed in Doll and Peto, "Avoidable Risks of Cancer," and explained in detail in Appendix E there.

26. B.E. Henderson, L.N. Kolonel, and F.H. Foster, "Cancer in Polynesians," National Cancer Institute Monograph No. 62, National Institutes of Health, U.S. Department of Health and Human Services, Bethesda, Md., December 1982; Repace and Lowrey, "Nonsmokers' Lung Cancer Risk from Passive Smoking."

27. DHEW, Public Health Service, *Smoking and Health.*

28. Karl Kronebusch, "Smoking Related Deaths and Financial Costs," Office of Technology Assessment, U.S. Congress, Staff Memo, Washington, D.C., September 1985; DHHS, OSH, *The Health Consequences of Smoking—Chronic Obstructive Lung Disease: A Report of the Surgeon General* (Washington, D.C.: U.S. Government Printing Office, 1984).

29. Fire fatalities from Ravenholt, "Addiction Mortality in the United States, 1980"; Repace and Lowrey, "Nonsmokers' Lung Cancer Risk from Passive Smoking."

30. D. Hill, "Tobacco Dependency-Problems and Progress," in National Alcohol and Drug Dependence Multidisciplinary Institute 78, Canberra, Australia, August 27-September 1, 1978 (Canberra: Australian Foundation on Alcohol and Drug Dependence, date unknown); N.E. Collishaw and G. Myers, "Dollar Estimates of the Consequences of Tobacco Use in Canada, 1979," *Canadian Journal of Public Health*, May/June 1984; OSH translated abstract of R.E. Leu et al., "The Political-Economical Costs of Smoking: A Reply" (letters), *Schweizerische Medizinische Wochenschrift*, September 24, 1983; Royal College of Physicians, *Health or Smoking.*

31. Kronebusch, "Smoking Related Deaths and Financial Costs." See also Bryan R. Luce and Stuart O. Schweitzer, "Smoking and Alcohol Abuse: A Comparison of Their Economic Consequences," *New England Journal of Medicine*, March 9, 1978; Dorothy P. Rice and Thomas A. Hodgson, "Economic Costs of Smoking: An Analysis of Data for the United States," presented at the Allied Social Science Association Annual Meetings, San Francisco, Calif., December 28, 1983.

32. As cited in translated abstract, K. Gibinski et al., "Morbid Economic Effects of Tobacco Smoking in the District of Katowice," *Polski Tygodnik Lekarski*, May 19, 1980 (in Polish); M.E. Thompson and W.F. Forbes, "Costs and 'Benefits' of Cigarette Smoking in Canada," *Canadian Medical Association Journal*, November 1, 1982.

33. Estimates based on data in USDA, FAS, "Tobacco—World Tobacco Situa-

tion," and on USDA, Economic Research Service, *World Indices of Agricultural and Food Production, 1950-84* (unpublished printout) (Washington, D.C.: 1985).

34. The 50 percent increase in lung cancer deaths is based on the equation of deaths as a function of cigarettes consumed, assuming that lung cancer in the year 2000 would be a function of cigarette consumption in 1980; reduced risk for ex-smokers from Doll and Peto, "Avoidable Risks of Cancer."

35. Repace and Lowrey, "Nonsmokers' Lung Cancer Risk from Passive Smoking"; James L. Repace and Alfred H. Lowrey, "Indoor Air Pollution, Tobacco Smoke, and Public Health," *Science*, May 2, 1980; James L. Repace, "The Problem of Passive Smoking," *Bulletin of the New York Academy of Medicine*, Second Series, December 1981; Pelayo Correa, "Passive Smoking and Lung Cancer," *Lancet*, September 10, 1983.

36. Hirayama, "Non-Smoking Wives of Heavy Smokers: A Study from Japan." For a brief review of 14 studies of passive smoking, see Repace and Lowrey, "Nonsmokers' Lung Cancer Risk from Passive Smoking."

37. Greek study from D. Trichopoulos et al., "Lung Cancer and Passive Smoking," *International Journal of Cancer*, Vol. 27, 1981, pp. 1-4; Correa et al., "Passive Smoking and Lung Cancer"; German study from translated abstract of A. Knoth, H. Bohn, and F. Schmidt, "Passive Smoking as a Causal Factor of Bronchial Carcinoma in Female Nonsmokers," *Medizinische Klinik*, February 4, 1983.

38. Repace and Lowrey, "Nonsmokers' Lung Cancer Risk from Passive Smoking"; Repace and Lowrey, "Indoor Air Pollution, Tobacco Smoke, and Public Health"; Vivian E. Thompson et al., "The Air Toxics Problem in the United States: An Analysis of Cancer Risks Posed by Selected Air Pollutants," *Journal of the Air Pollution Control Association*, May 1985.

39. These examples assume 1 milligram tar cigarettes. J.L. Repace, "Effect of Ventilation on Passive Smoking Risk in a Model Workplace," in J.E. Janssen, *Management of Atmospheres in Tightly Enclosed Spaces*, Proceedings of an Engineering Foundation Conference, Santa Barbara, Calif., October 17-21, 1983 (Atlanta: American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., 1983).

40. Ibid.

41. I. Batar, R.P. Bernard, and L. Lampe, "Effects of Hypertensive Disorders on the Outcome of Pregnancy: Early Findings of Maternity Care Monitoring (MCM) in Debrecen, Hungary," *Clinical and Experimental Hypertension*, 1982; J.M. Foidart, "Tobacco and Pregnancy," *Revue Medicale de Liege*, September 1, 1983 (in French).

42. S. Wilner et al., "A Comparison of Smoking and Other Maternal Behavior During Pregnancy of Patients in a Health Maintenance Organization and Fee-For-Service Practices," in *Maternity Care in Two Health Care Systems*, Doctoral Dissertation Abstracts, Harvard University, June 1981; M. Chansoriya, K.K. Kaul, and R.C. Verma, "Effect of Tobacco Chewing by Mothers on Fetal Outcome," *Indian Pediatrics*, February 1983; and P.C. Gupta et al., "Mortality Experience in Relation to Tobacco Chewing and Smoking Habits from a 10-Year Follow-Up Study in Ernakulam District, Kerala," *International Journal of Epidemiology*, Vol. 13, No. 2, June, 1984.

43. Ravenholt, "Addiction Mortality in the United States, 1980"; E. Menghetti, "Maternal Smoking in Pregnancy: Recent Acquisitions on Its Consequences in Infants," *Rivista Italiana di Pediatria*, March/April 1983 (in Italian); G. Moggian et al., "Statistical Investigation of the Effects of Smoking During Pregnancy," *Giornale Italiano di Ostetricia e Ginecologia*, November 1983 (in Italian).

44. U.K. surveys from N. Nichol and J. Russell, "A Study of the Smoking Habits of Pregnant Women and Their Attitudes to Smoking in Hospital," *Health Bulletin*, September 1983; Ravenholt, "Addiction Mortality in the United States, 1980." The estimate of 3 million is a minimum based on the data in Table 5.

45. As cited in Royal College of Physicians, *Health or Smoking*. Recent studies suggesting increased risk of respiratory disease in children as a result of parental smoking include A. Charlton, "Children's Coughs Related to Parental Smoking," *British Medical Journal*, June 2, 1984, and W.J. Morgan and L.M. Taussig, "The Chronic Bronchitis Complex in Children," *Pediatric Clinics of North America*, August 1984.

46. Trager et al., "Longitudinal Study of Maternal Smoking."

47. Ibid.

48. Alan Blum, "If Smoking Killed Baby Seals," *New York State Journal of Medicine*, July 1985.

49. For an example of this argument, see William F. Buckley, Jr., "The Weed," in William R. Finger, *The Tobacco Industry in Transition* (Lexington, Mass.: Lexington Books, 1981).

50. Bryan R. Luce and Stuart O. Schweitzer, "Smoking and Alcohol Abuse: A Comparison of Their Economic Consequences," *New England Journal of Medicine*, March 9, 1978; National Research Council, Committee on Diet, Nutrition, and Cancer, *Diet, Nutrition, and Cancer* (Washington, D.C.: National Academy Press, 1982). For an overview of the relative carcinogenic risk of common items, see B.N. Ames, "Dietary Carcinogens and Anticarcinogens," *Science*, September 23, 1983.

51. Roemer, *Legislative Action*; USDA, FAS, "Tariff and Nontariff Restrictions on Tobacco."

52. A number of multiple linear regressions were performed with data on smoking per capita, cigarette price, per capita income, and policy strength. The strength of policy consistently showed a small but positive association with consumption even when price and income were controlled for. The association between price and consumption was not meaningful, perhaps because prices are controlled in many countries. In one regression of consumption on per capita income and policy strength, the result was Ln (Consumption) = 4.2 + .31 × Ln (Income) + .21 × Ln (Policy Score); (t = 4.15 and 1.77, respectively; R^2 = .63). Policy scores were based on Roemer, *Legislative Action*, and on USDA, FAS, "Tariff and Nontariff Measures on Tobacco." Price elasticity for the United States was estimated to be − .3, using data from Tobacco Institute, *The Tax Burden on Tobacco: Historical Compilation 1983* (Washington, D.C.: 1984). Consumption data in this section are from USDA, computer printout. See also, Harvard University Institute for the Study of Smoking Behavior and Policy, "The Cigarette Excise Tax," Cambridge, Massachusetts, April 17, 1985.

53. Royal College of Physicians, *Health or Smoking*.

54. Shiffman, "The Tobacco Withdrawal Syndrome."

55. For a brief overview of specific actions in the nonsmokers' rights movement, see *New York State Journal of Medicine*, July 1985, Phyllis L. Kahn, "The Minnesota Clean Indoor Air Act, A Model for New York and Other States," *New York State Journal of Medicine*, December 1983, and "Effects of 'Passive Smoking' Lead Nonsmokers to Step Up Campaign," *Journal of the American Medical Association*, May 24/31, 1985.

56. American Cancer Society, "Clean Indoor Air Legislation—Update on Division Experience," Washington, D.C., revised, January 1985.

57. Ibid.

58. Jonathan E. Fielding, "Effectiveness of Employee Health Improvement Programs," *Journal of Occupational Medicine*, November 1982; Environmental Improvement Associates, "Improving the Work Environment: A Management Guide to Smoke Free Work Areas," Salem, N.J., January 1983; Marvin M. Kristein, "How Much Can Business Expect to Profit from Smoking Cessation?," *Preventive Medicine*, Vol. 12, 1983, pp. 358-381.

59. Human Resources Policy Corporation, "Smoking Policies in Large Corporations," Los Angeles, 1985.

60. Zhao Jinming, "Tobacco Industry Sets Dual Targets," *China Daily*, May 22, 1985; Bharat Dogra, "Farm Exports from a Hungry Land," *Economic and Political Weekly*, March 23, 1985.

61. "How EEC Subsidises Smoking," *New Scientist*, May 17, 1984; Lawrence Spohn, "Tobacco Dilemma Intensifying in North Carolina," *New York State Journal of Medicine*, July 1985.

62. World Health Organization, *Smoking Control Strategies in Developing Countries*, Technical Report Series 695 (Geneva: 1983).

63. The nations in this category are mainly in Africa and in the Andes. Examples include: Chad, Ethiopia, Niger, Nigeria, Peru, Sudan, Uganda, and Zaire, all of which record annual consumption of fewer than 300 cigarettes per capita (age 15 and older), and in many of which the figure is less than 200.

64. Royal College of Physicians, *Health or Smoking*.

WILLIAM U. CHANDLER is a Senior Researcher with Worldwatch Institute. He is the author of Worldwatch Papers on improving world health, energy productivity, and investing in children, and of *The Myth of TVA*.

THE WORLDWATCH PAPER SERIES

No. of Copies

_____ 1. **The Other Energy Crisis: Firewood** by Erik Eckholm.
_____ 2. **The Politics and Responsibility of the North American Breadbasket** by Lester R. Brown.
_____ 3. **Women in Politics: A Global Review** by Kathleen Newland.
_____ 4. **Energy: The Case for Conservation** by Denis Hayes.
_____ 5. **Twenty-two Dimensions of the Population Problem** by Lester R. Brown, Patricia L. McGrath, and Bruce Stokes.
_____ 6. **Nuclear Power: The Fifth Horseman** by Denis Hayes.
_____ 7. **The Unfinished Assignment: Equal Education for Women** by Patricia L. McGrath.
_____ 8. **World Population Trends: Signs of Hope, Signs of Stress** by Lester R. Brown.
_____ 9. **The Two Faces of Malnutrition** by Erik Eckholm and Frank Record.
_____ 10. **Health: The Family Planning Factor** by Erik Eckholm and Kathleen Newland.
_____ 11. **Energy: The Solar Prospect** by Denis Hayes.
_____ 12. **Filling The Family Planning Gap** by Bruce Stokes.
_____ 13. **Spreading Deserts—The Hand of Man** by Erik Eckholm and Lester R. Brown.
_____ 14. **Redefining National Security** by Lester R. Brown.
_____ 15. **Energy for Development: Third World Options** by Denis Hayes.
_____ 16. **Women and Population Growth: Choice Beyond Childbearing** by Kathleen Newland.
_____ 17. **Local Responses to Global Problems: A Key to Meeting Basic Human Needs** by Bruce Stokes.
_____ 18. **Cutting Tobacco's Toll** by Erik Eckholm.
_____ 19. **The Solar Energy Timetable** by Denis Hayes.
_____ 20. **The Global Economic Prospect: New Sources of Economic Stress** by Lester R. Brown.
_____ 21. **Soft Technologies, Hard Choices** by Colin Norman.
_____ 22. **Disappearing Species: The Social Challenge** by Erik Eckholm.
_____ 23. **Repairs, Reuse, Recycling—First Steps Toward a Sustainable Society** by Denis Hayes.
_____ 24. **The Worldwide Loss of Cropland** by Lester R. Brown.
_____ 25. **Worker Participation—Productivity and the Quality of Work Life** by Bruce Stokes.
_____ 26. **Planting for the Future: Forestry for Human Needs** by Erik Eckholm.
_____ 27. **Pollution: The Neglected Dimensions** by Denis Hayes.
_____ 28. **Global Employment and Economic Justice: The Policy Challenge** by Kathleen Newland.
_____ 29. **Resource Trends and Population Policy: A Time for Reassessment** by Lester R. Brown.
_____ 30. **The Dispossessed of the Earth: Land Reform and Sustainable Development** by Erik Eckholm.
_____ 31. **Knowledge and Power: The Global Research and Development Budget** by Colin Norman.
_____ 32. **The Future of the Automobile in an Oil-Short World** by Lester R. Brown, Christopher Flavin, and Colin Norman.
_____ 33. **International Migration: The Search for Work** by Kathleen Newland.
_____ 34. **Inflation: The Rising Cost of Living on a Small Planet** by Robert Fuller.
_____ 35. **Food or Fuel: New Competition for the World's Cropland** by Lester R. Brown.
_____ 36. **The Future of Synthetic Materials: The Petroleum Connection** by Christopher Flavin.
_____ 37. **Women, Men, and The Division of Labor** by Kathleen Newland.
_____ 38. **City Limits: Emerging Constraints on Urban Growth** by Kathleen Newland.

_____ 39. **Microelectronics at Work: Productivity and Jobs in the World Economy** by Colin Norman.
_____ 40. **Energy and Architecture: The Solar and Conservation Potential** by Christopher Flavin.
_____ 41. **Men and Family Planning** by Bruce Stokes.
_____ 42. **Wood: An Ancient Fuel with a New Future** by Nigel Smith.
_____ 43. **Refugees: The New International Politics of Displacement** by Kathleen Newland.
_____ 44. **Rivers of Energy: The Hydropower Potential** by Daniel Deudney.
_____ 45. **Wind Power: A Turning Point** by Christopher Flavin.
_____ 46. **Global Housing Prospects: The Resource Constraints** by Bruce Stokes.
_____ 47. **Infant Mortality and the Health of Societies** by Kathleen Newland.
_____ 48. **Six Steps to a Sustainable Society** by Lester R. Brown and Pamela Shaw.
_____ 49. **Productivity: The New Economic Context** by Kathleen Newland.
_____ 50. **Space: The High Frontier in Perspective** by Daniel Deudney.
_____ 51. **U.S. and Soviet Agriculture: The Shifting Balance of Power** by Lester R. Brown.
_____ 52. **Electricity from Sunlight: The Future of Photovoltaics** by Christopher Flavin.
_____ 53. **Population Policies for a New Economic Era** by Lester R. Brown.
54. **Promoting Population Stabilization: Incentives for Small Families** by Judith Jacobsen
_____ 55. **Whole Earth Security: A Geopolitics of Peace** by Daniel Deudney
_____ 56. **Materials Recycling: The Virtue of Necessity** by William U. Chandler
_____ 57. **Nuclear Power: The Market Test** by Christopher Flavin
_____ 58. **Air Pollution, Acid Rain, and the Future of Forests** by Sandra Postel
_____ 59. **Improving World Health: A Least Cost Strategy** by William U. Chandler
_____ 60. **Soil Erosion: Quiet Crisis in the World Economy** by Lester Brown and Edward Wolf.
_____ 61. **Electricity's Future: The Shift to Efficiency and Small-Scale Power** by Christopher Flavin
_____ 62. **Water: Rethinking Management in an Age of Scarcity** by Sandra Postel
_____ 63. **Energy Productivity: Key to Environmental Protection and Economic Progress** by William U. Chandler
_____ 64. **Investing in Children** by William U. Chandler
_____ 65. **Reversing Africa's Decline** by Lester Brown and Edward Wolf.
_____ 66. **World Oil: Coping With the Dangers of Success** by Christopher Flavin
_____ 67. **Conserving Water: The Untapped Alternative** by Sandra Postel
_____ 68. **Banishing Tobacco** by William U. Chandler

_____ **Total Copies**

Single Copy—$4.00

Bulk Copies (any combination of titles)
2-5: $3.00 each 6-20: $2.00 each 21 or more: $1.00 each

Calendar Year Subscription (1986 subscription begins wth Paper 68)
U.S. $25.00 _____

Make check payable to Worldwatch Institute
1776 Massachusetts Avenue NW, Washington, D.C. 20036 USA

Enclosed is my check for U.S. $ _____

name _____

address _____

city **state** **zip/country**